

What is electricity?

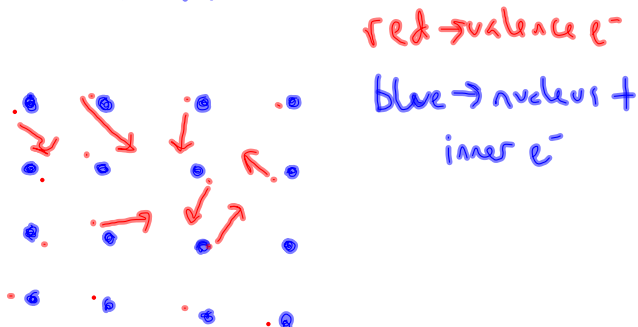
- flow of e^-
- Usain Bolt
- Static shock
- It can hurt
- AC ∇ DC
- relates to magnetism
- travels through some materials better than others
- current
- Ben Franklin

Atomic Structure:

- proton	} nucleus	electric charge
- neutron		$+1e$
- electron		\emptyset
		$-1e$



- Valence e^- are important
- Types of bonding:
 - Ionic \rightarrow transfer of e^-
metal/non-metal
 - Covalent \rightarrow sharing of e^-
non-metal/non-metal
 - Metallic \rightarrow free-floating e^-
"sea of electrons"
metals



- Conductor \rightarrow material that allows charge to pass through easily
happens in metals
- Insulators \rightarrow material that does not allow e^- to move through it
charge can still be on insulator, it is just in one spot
examples: rubber, wood, styrofoam (non-metals)
- Semiconductors \rightarrow material that sometimes acts as conductor, sometimes as insulator
metalloids, especially Si and Ge
- Law of Conservation of Charge:
Charge is neither created nor destroyed, just transferred.

- Moving e^- :



More e^- than p^+ , material is net negative

More p^+ than e^- , material is net positive

Ways to charge an object:

1. Contact

- two obj. physically touching to transfer e^-

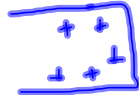
2. Induction

net neutral

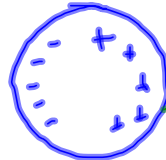


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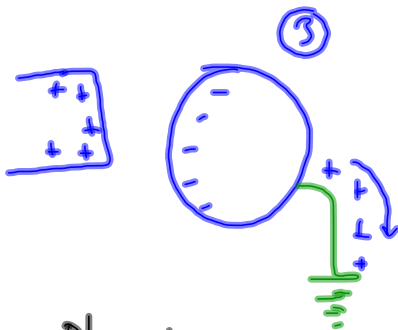
Conductor, so charge moves easily on surface



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Symbol for ground



Plus charges leave to ground

remove ground wire, then remove rod

④



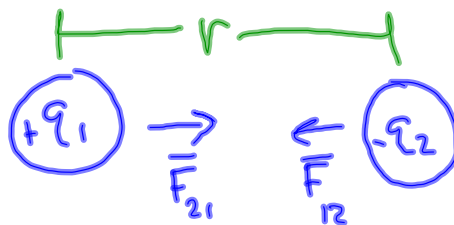
sphere is now net negative

Coulomb's Law:

$$F = k_c \frac{|q_1| |q_2|}{r^2}$$

charge
 absolute value
 sign
 distance bet. center of
 charges
 Coulomb's constant
 force

$$k_c = 8.99 \times 10^9 \text{ N} \cdot \text{m}^2 / \text{C}^2$$



charge measured in C (Coulombs)

- Like charges repel, unlike charges attract
- F is a vector! Magnitude from Coulomb's law, direction from attraction/repulsion
- We can find net force on a particle:

$$\vec{F}_1 = \vec{F}_{21} + \vec{F}_{31} + \vec{F}_{41}$$

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② ③ ④